



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : H04L 29/12, 12/24		A1	(11) International Publication Number: WO 00/27093
			(43) International Publication Date: 11 May 2000 (11.05.00)
(21) International Application Number: PCT/CA99/01013		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 29 October 1999 (29.10.99)			
(30) Priority Data: 2,252,207 30 October 1998 (30.10.98) CA			
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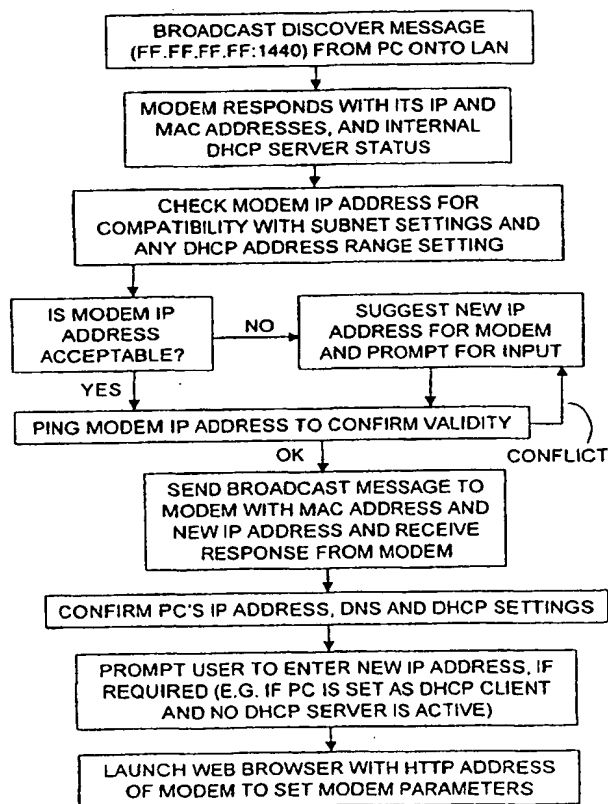
Published

With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: DIGITAL NETWORK MODEM AND CONFIGURATION SYSTEM FOR A DIGITAL NETWORK MODEM

(57) Abstract

A network modem has an initialization control module for setting its static local network address remotely via the local network in response to a request by a configuration station. The configuration station sends a request on the local network to the modem to obtain identification and a static IP address from the modem, receives a response from the modem and displays the static IP address, accepts user input to set said static IP address, and sends a request on the local network to the modem to set said static address. The system allows a user to set the static IP address for the modem, configure the modem settings, as well as the settings for the station. The system is easy to use and can work even if initial modem and configuration station communications parameters are incompatible.



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DIGITAL NETWORK MODEM AND CONFIGURATION SYSTEM FOR A DIGITAL NETWORK MODEM

Field of the Invention

- 5 The present invention relates to a digital network modem, such as an ISDN or a DSL modem, and more particularly to a digital network modem having a modem address configuration system.

Background of the Invention

- 10 When installing new equipment to be connected to a network, such as a local area network (LAN), it is necessary to assign an (Internet protocol) IP network address to the new equipment, and a variety of methods for doing so are used. The most basic form of address management is to manually assign an IP address to the new equipment by directly setting or programming the network
- 15 address at the new equipment using knowledge (i.e. a list) of IP addresses already used on the network, so as to be able to select a new and available address. The network manager or administrator is thus the "keeper" of the list of used addresses, and he or she is required to install any new equipment on the network. It is also common for the equipment to have a factory set IP address,
- 20 and for the network administrator to use the factory address if it is within the range of usable addresses on the network, and it is not already assigned to a different device. If the factory set address is not compatible with the range of addresses used on the LAN, it is necessary to change the IP address of the new equipment.

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To change the static IP address of new equipment to be compatible with the LAN requires an input interface. It is known to use a communications interface on the equipment to which a console can be connected to provide the input interface, and it is also known to use DIP switches on the equipment for setting

the static address. These options either require considerable effort and/or extra equipment.

To facilitate the management of IP addresses in local area networks (LANs), it is known to provide servers called dynamic host configuration protocol or DHCP servers. These servers respond to requests from clients connected to the network to receive assigned dynamic IP addresses for communication purposes on the network. The advantage of using such a dynamic IP address assignment is that new clients can be added easily, and the effort to manage the addresses used on the network is reduced. In most cases, a DHCP server is provided by software added to a network server.

While DHCP can be adapted for use in assigning static IP addresses, it is often preferred to allow only the network administrator the ability to assign static addresses. Static IP addresses are required by certain types of equipment, usually network resource equipment, such as modems or servers.

When a network which was previously not connected to other networks or when a network needs a faster or additional connection to other networks, digital network modems are added to provide the desired connection. Network modems, such as ISDN modems, are assigned a static IP address on the LAN. When a DHCP server is provided on the LAN, clients on the LAN are assigned their IP addresses and can recognize the modem as a router or gateway by consulting the DHCP, and in this way, each client does not need to have prior knowledge of any fixed IP address for the modem.

Computer networks are being installed in more and more residential, office and industrial environments, and the increase in the number of such networks has increased the need for skilled technicians required to configure and maintain

such networks. While computer networks were very uncommon a few years ago for home users, it is now economically feasible and desirable to interconnect computer devices in a home environment. Any simplification of the task of network management is important from the perspective of both increased reliability and reduced training for the network manager.

Summary of the Invention

It is an object of the invention to provide in a digital network modem a mechanism for initializing a static IP address for the modem on the LAN via communication with a configuration station on the LAN.

According to the invention a network modem has an initialization control module for setting its static IP address remotely via the local network in response to a request by a configuration station. The configuration station sends a request on the local network to the modem to obtain identification and static IP address from the modem, receives a response from the modem and displays the static IP address, accepts user input to set the static IP address, and sends a request on the local network to the modem to set the static IP address. The system allows a user to set the static IP address for the modem, configure the modem settings, as well as the settings for the station. The system is easy to use and can work even if initial modem and configuration station communications parameters are incompatible.

The invention thus provides a network modem device configuration system connected to a modem via a local network, the system comprising a first module sending a request on the local network to the modem to obtain identification and static IP address from the modem, a second module receiving a response from the modem and displaying the static IP address, a third module accepting user input to set the static IP address, and a fourth module sending a

request on the local network to the modem to set the static address. Preferably, the system further comprises a fifth module testing the static address on the network and, when the testing fails to validate operation of the static address for the modem, one of displaying an error message and prompting the user to
5 input new data for the static address. Preferably, the first module sends a broadcast discover message on the local network to the modem on a specific IP port to solicit a response identifying the modem, the second module receives and decodes a response from the modem to obtain the identification and static IP address, and the fourth module broadcasts on the local network to the
10 modem a message including the identification of the modem and an identification of the set static address.

Preferably, the system also comprises a parameter setting interface system allowing modem parameters to be set at the configuration system. The
15 parameter setting interface system may include a save and restore mechanism allowing the modem parameters to be saved in storage external from the modem and restored to the modem from the storage. The parameter setting interface system is preferably provided by a web browser displaying pages requested from the modem, and the system advantageously comprises a sixth
20 module for launching the web browser with an HTTP request addressed to the static address.

The configuration system according to the invention may be provided by software running in a client station connected to the local network. Therefore,
25 the invention also provides a computer program product, as well as a method of transmitting a data signal which comprises a computer program executable in the client station for providing the configuration system according to the invention.

According to the invention, there is also provided a network modem device comprising a mechanism for initializing a static address of the device on a local network, the device being characterized in that the mechanism communicates via the local network and is responsive to a request by a configuration station on the local network to provide modem setting data to, and accept setting information from, the configuration station to change said static address.

Brief Description of the Drawings

The invention will be better understood by way of the following detailed description of a preferred embodiment with reference to the appended drawings, in which:

Fig. 1 is a schematic block diagram of the LAN ISDN modem according to the preferred embodiment connected to a LAN to which a configuration station and a network DHCP server are also connected; and

Fig. 2 is a flow chart illustrating the steps following in configuring and installing the modem using a configuration station.

Detailed Description of the Preferred Embodiment

As illustrated in Fig. 1, the digital modem 10 according to the preferred embodiment is an ISDN modem having a plurality of functional components shown in Fig. 1. The separation of components illustrated in the separate blocks in Fig. 1 is for the purposes of illustration only, and does not necessarily reflect the physical separation of components in the real device which is built from both hardware and software/firmware components.

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In accordance with the present invention, the modem 10 may be installed in the network environment by assigning it an IP address either by direct connection or via the network. The address initializer module 14 provided in modem 10 communicates both with LAN interface 12 and a serial port in communication

with a console 15. The console 15 may be provided by a PC running a terminal program. The modem is preferably provided with a factory IP address (192.168.1.1) which is first tried. If the factory installed address is not usable, the following mechanism is used to install the modem 10 on the existing
5 network where the IP addresses are already defined. In the prior art, the network IP address for the modem was communicated to the modem by using a console connected to the modem by a serial port, and thus the IP address for the modem was not set through the network (it is also known in the art to allow the IP address to be set in the factory, by keyboard input or by DIP switches).

10 The modem 10 must have a static IP address (i.e. a dynamic address from either DHCP server 28 or 16 is not to be used), and configuration station 24 is used in configuring the IP address for the modem 10 via the LAN 22. The configuration station 24 may have a static IP address or it may be a DHCP
15 client and have a dynamic IP address. A system tray or modem monitor program 26 in the configuration station is used to assign modem 10 its static IP address.

20 In the preferred embodiment, modem 10 communicates with configuration station 24 either using HTML pages and an IP connection, or using menus with a terminal connection via LAN 22 or console 15.

As illustrated in Fig. 2, the steps involved in configuring modem 10 in the preferred embodiment can be described as follows. The modem 10 is connected
25 to LAN 22 and powered on. The modem has a factory set static IP address, and initializer 14 is able to communicate either with station 24 or console 15 to receive a command to change its address. When the address change is done using the station 24, the modem monitor 26 is used to determine, confirm and

set the static IP address in the modem 10 by communicating via LAN 22 with the initializer 14.

To communicate with modem 10 initially, the system tray 26 discovers the
5 modem 10 by sending a broadcast packet on a predetermined proprietary port 1440. If modem 10 and the configuration station 24 are not on the same sub-net, the system tray 26 can ask modem 10 to change its address to be on the same sub-net. The system tray 26 thus sends a proprietary discovery user datagram protocol (UDP) broadcast message to a predetermined port, (e.g. the
10 port chosen in the preferred embodiment is 1440, and thus the address is FF.FF.FF.FF:1440), which broadcast message is detected by initializer 14. In response to the broadcast, initializer 14 sends a reply broadcast message to port 1440, namely to address FF.FF.FF.FF:1440, including the MAC address of modem 10 in the packet. The modem monitor 26 then sends a broadcast packet
15 to port 1440 including in the packet the MAC address of modem 10 along with the static IP address to be used. Initializer 14 recognizes its own MAC address in the packet broadcast from the system tray 26 and sets the IP address for the modem 10 to the address contained in the packet.

20 In selecting the IP address for modem 10, the configuration station is equipped with software, namely utility programs called Wizards, to help the user of station 24 install modem 10 by finding an available address for modem 10 on network 22. Such programs provide a list of all used static addresses, as well as the range of addresses reserved for dynamic allocation. The address for
25 modem 10 must also be identified as a gateway or router and, in the preferred embodiment, as a domain name server (DNS) since modem 10 includes a DNS relay module 19. The system tray 26 has an interface allowing the network manager to enter an appropriate static IP address for the modem. The static address should be outside the range of DHCP addresses, or it should otherwise

be reserved as a static address. If station 24 is a DHCP client and get its address from DHCP Server 16, the modem IP address can be assumed to be correct. However, in all cases, a ping message is sent by station 24 to the defined IP address before setting the modem's IP address to ensure that it is unique and valid. At this stage, the entered static IP address is validated.

The configuration station 24 may also require to have its network setting adjusted as a result of the installation of the modem onto the LAN 22. As illustrated in Fig. 2, when the station 24 is a DHCP client, and there is no DHCP server, it is necessary to enter a static address of the station 24, and the modem monitor 26 provides this interface. Likewise, changes to the DHCP status, DNS and subnet parameters, which are caused by the introduction of the modem 10 can be set using the settings interface provided by the modem monitor 26. The modem monitor can also obtain information about the network, such as the status of DHCP servers on the network, by requesting the modem 10 to carry out communications task on the LAN 22, which the station 24, configured conventionally, can have difficulty carrying out itself. In this way, the modem 10 is used as a network resource for helping the modem monitor 26 perform its functions.

Once the static address has been confirmed, the modem monitor launches a web-based configuration interface for allowing the network administrator to set the modem parameters. The web-based interface, namely a web browser, is launched to automatically initiate an HTTP request to the validated IP address of the modem. The modem parameters include the ISDN numbers, connection time parameters, external DNS addresses, activation of the internal DNS caching and listing functions, editing of the modem's DNS list, DHCP parameters for the built-in DHCP server 16, password data, etc. These parameters can optionally be saved at station 24 for back-up purposes, and the

modern web-based configuration interface allows for both saving of these parameter to storage at station 24 as well as restoring of the parameters from storage at station 24.

13. The system according to claim 11 or 12, wherein said first module sends a broadcast discover message on the local network to the modem to solicit a response identifying the modem, said second module receiving and decoding a response from the modem to obtain said identification and static IP address, and said fourth module broadcasts on the local network to the modem a message including said identification of the modem and an identification of the set static address.

14. The system according to claim 12 or 13, wherein said broadcast message sent by said first and fourth modules, and received by said second module is transmitted on a proprietary port.

15. The system according to any one of claims 11 to 14, further comprising a parameter setting interface system allowing modem parameters to be set at the configuration system.

16. The system according to claim 15, wherein the parameter setting interface system includes a save and restore mechanism allowing said modem parameters to be saved in storage external from the modem and restored to the modem from said storage.

17. The system according to claim 15 or 16, wherein the parameter setting interface system is provided by a web browser displaying pages requested from the modem, said system further comprising a sixth module for launching the web browser with an HTTP request addressed to said static address.

18. The system according to claim 15, 16 or 17, wherein said modem is an ISDN modem, said modem parameters are selected from the group consisting of DHCP configuration settings, DNS settings, and ISDN connection settings

19. The system according to any one of claims 11 to 18, wherein said system is a client station, further comprising a seventh module allowing a network configuration of said station to be set in consideration of changes to said local network due to an addition of said modem to said local network.

20. A computer program product for a client station having communications capability with a local network, said product comprising a computer readable medium having recorded program data, which when loaded into the client station provides the system according to any one of claims 11 to 19.

21. A method of transmitting a data signal to a client station having communications capability with a local network, wherein said data signal when loaded into the client station provides the system according to any one of claims 11 to 19.

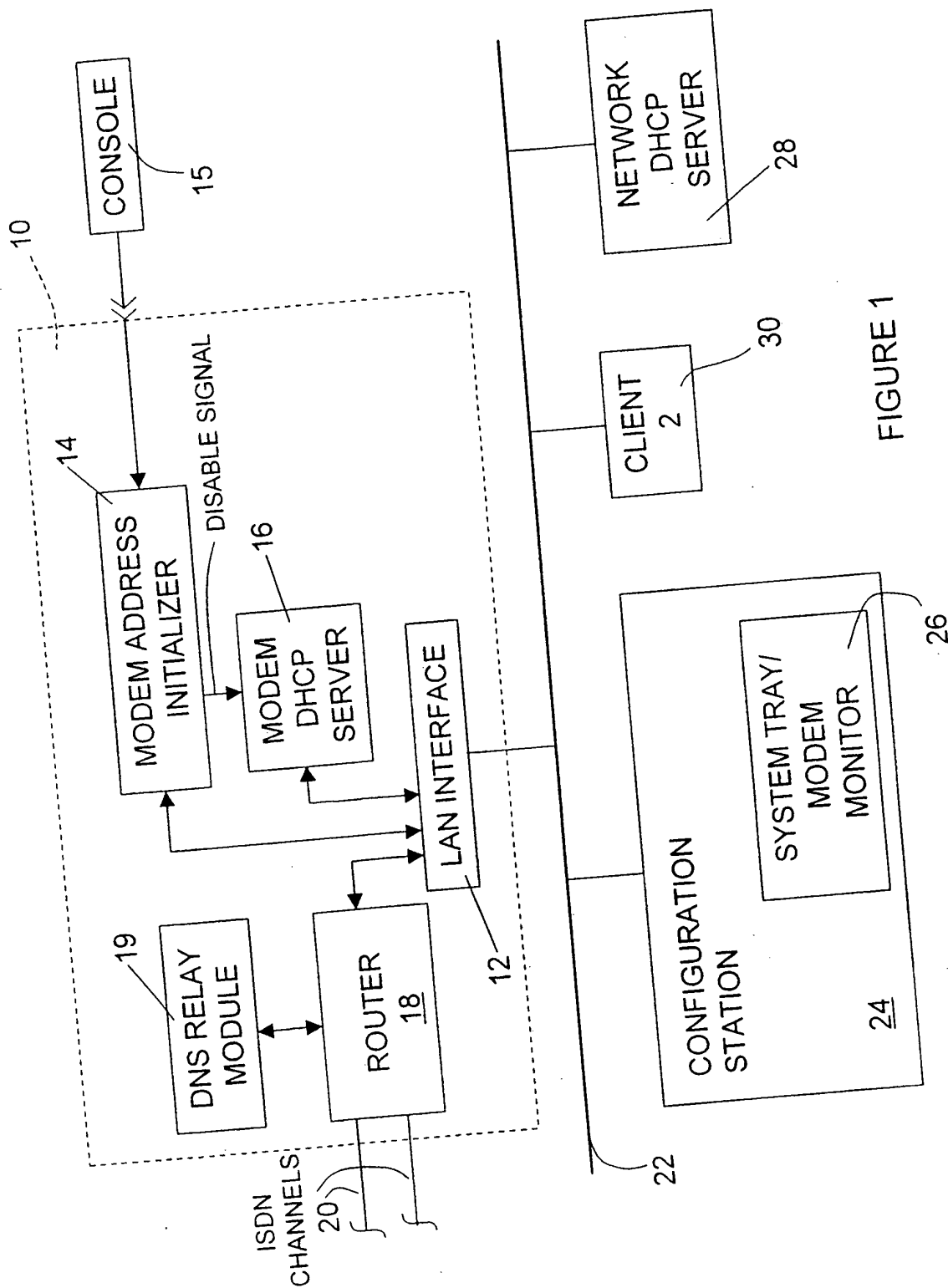
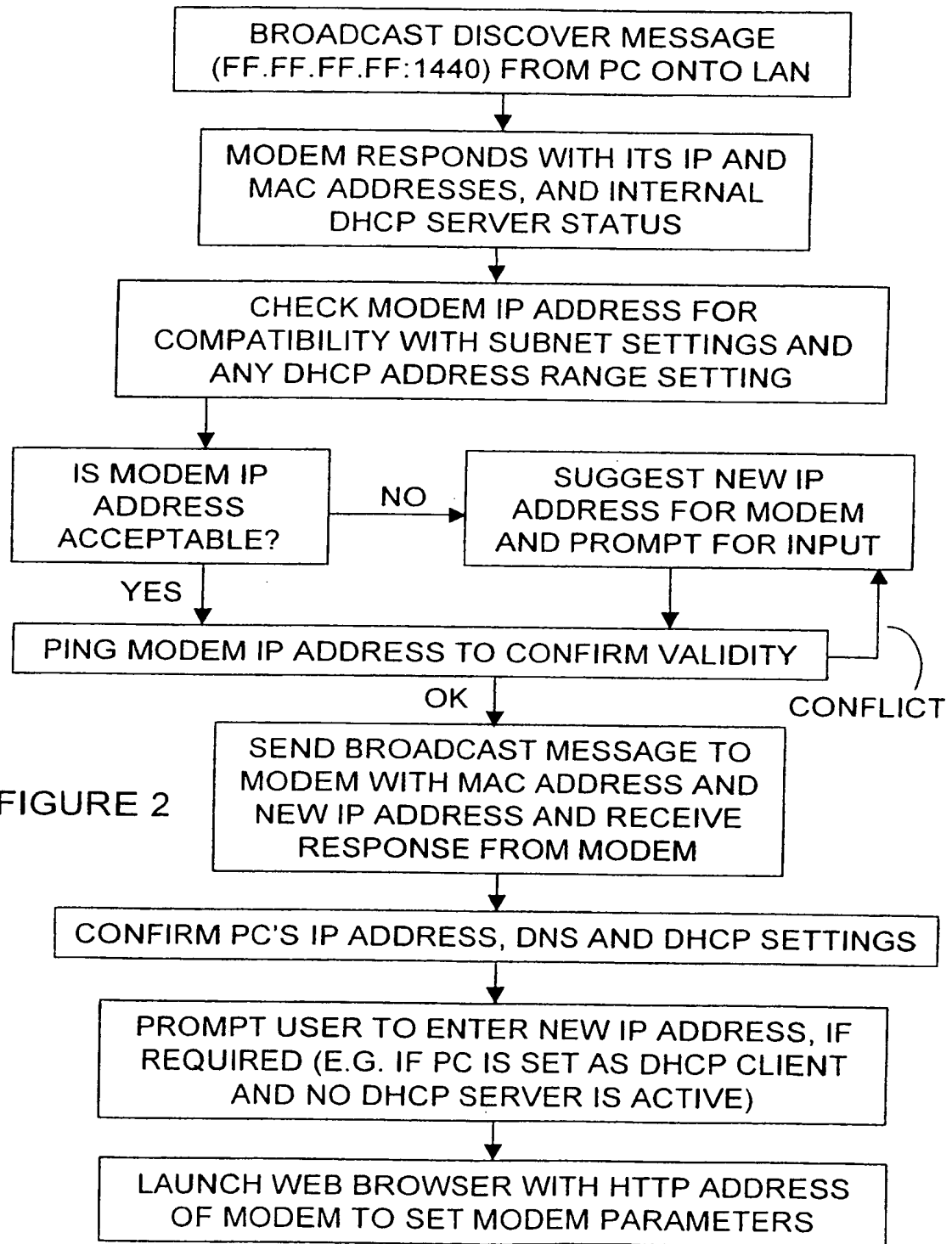


FIGURE 1

2/2



INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA 99/01013

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/12 H04L12/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	LOUCKS W M ET AL: "IMPLEMENTATION OF A DYNAMIC ADDRESS ASSIGNMENT PROTOCOL IN A LOCAL AREA NETWORK" COMPUTER NETWORKS AND ISDN SYSTEMS, NL, NORTH HOLLAND PUBLISHING. AMSTERDAM, vol. 11, no. 2, February 1986 (1986-02), pages 133-146, XP000811184 ISSN: 0169-7552 page 133, right-hand column, line 1 -page 137, left-hand column, line 9 page 141, right-hand column, line 44 -page 143, left-hand column, line 12 -/-	1-3, 6, 7, 20, 21 11

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

10 March 2000

Date of mailing of the international search report

24/03/2000

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	abstract page 1, line 27 -page 4, line 32 page 6, line 12-15 page 7, line 17 -page 10, line 30 page 11, line 32 -page 12, line 11 page 15, line 17-23 page 17, line 18 -page 20, line 32 figure 6	4, 18
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INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No
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